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What are the Optimal Combinations of Parenting Intervention Components to Reduce Physical Child Abuse Recurrence? Reanalysis of a Systematic Review using Qualitative Comparative Analysis

Parenting interventions are widely used to reduce physical child abuse, but evidence for their effectiveness is mixed, partly because standard methods for synthesising the effectiveness of interventions do not address complex causation. We addressed this by using qualitative comparative analysis to understand pathways to effectiveness in social learning theory-based parenting interventions. After a systematic search of nine databases and independent and duplicate study selection, we included 14 interventions from ten evaluations. We categorised nine as most effective and five as least effective. We labelled interventions as to the presence or absence of parental self-management, attachment-based, alternative punishment or proactive parenting components. We examined how these combined in the most effective and least effective interventions, and identified common pathways to most effectiveness and least effectiveness. The final pathways revealed the importance of two components: alternative punishment strategies and parental self-management strategies. It was not clear that adding more components to an intervention necessarily translated to more effectiveness; indeed, this could backfire, as many of the least effective interventions combined multiple strategies without teaching parental self-management. Our findings may be useful to intervention developers and implementers when considering new interventions. Future research should seek to test combinations of components for differential effectiveness between the most effective pathways. © 2019 John Wiley & Sons, Ltd.

KEY PRACTITIONER MESSAGES:

- The effectiveness of social learning theory-based parenting interventions for physical child abuse is variable.

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‘[A] qualitative comparative analysis to understand pathways to effectiveness in social learning theory-based parenting interventions’

‘Parenting interventions are among the main strategies used to reduce and prevent physical child abuse’

‘Understanding why some interventions are more effective than others is important to guide practitioners and commissioners in selecting more effective interventions’

- We identified two key, but not necessary, components: alternative punishment strategies and parental self-management strategies.
- Adding more components did not necessarily lead to high effectiveness, and in some cases this could backfire when parental self-management was not included.

KEY WORDS: child abuse; systematic review; parenting interventions; qualitative comparative analysis

Introduction

Child abuse, and in particular physical child abuse, continues to be a pressing public health problem worldwide. Global estimates based on best evidence syntheses of surveys suggest a minimum lifetime prevalence of 21.6 per cent for physical child abuse, with a meta-analysis of all samples suggesting a lifetime prevalence of 17.7 per cent (Prevoe *et al.*, 2017). Child abuse by parents has important long-term consequences; longitudinal evidence shows that it not only has adverse consequences for mental health and psychosocial life chances (Young and Widom, 2014), but that it is also associated with diverse health conditions as an adult, including obesity, cancer, hypertension and stroke (Afifi *et al.*, 2016). International interest in this problem continues to grow, with a commitment to end child abuse forming section 16.2 of the *Sustainable Development Goals* (United Nations, 2017).

Parenting interventions are among the main strategies used to reduce and prevent physical child abuse. The evidence base for the effectiveness of current parenting interventions, however, is mixed. Some systematic reviews and meta-analyses suggest that parenting interventions effectively prevent physical child abuse (Bilukha *et al.*, 2005; Chen and Chan, 2016), while others suggest that they may reduce it but not prevent it (Euser *et al.*, 2015); still others judge the evidence to be promising but inconclusive (Mikton and Butchart, 2009; Peacock *et al.*, 2013), or note that parenting interventions generally may only be effective under specific circumstances or for specific subgroups (Reyno and McGrath, 2006). A shared conclusion drawn by these reviews is the large heterogeneity across studies: different trials, or trials in different contexts, yield different results about the effectiveness of parenting interventions for preventing and reducing the recurrence of physical child abuse.

One possible explanation for this substantial heterogeneity may be the different approaches that interventions adopt towards reducing child abuse. Although most interventions share a general focus on improving parental knowledge, skills and abilities to handle stress, enhance positive parenting and use non-violent disciplinary techniques, the number and type of components that they include are not uniform, and different combinations may not be equally effective. Some interventions (e.g. MacMillan *et al.*, 2005), focus primarily on increasing parenting support, whereas others (Chaffin *et al.*, 2004; Terao, 1999) focus on teaching parents very detailed parenting techniques to reinforce positive child behaviour and to react to children's misbehaviour in a non-violent way. Understanding why some interventions are more effective than others is important to guide practitioners and commissioners in selecting more effective interventions, and to comprehend the ‘active ingredients’ in interventions, thus leading to more efficient interventions.

Yet these previous reviews have rarely sought to understand this heterogeneity, and have not taken up methods suited to exploring differential effectiveness in these interventions. Several methods exist for understanding differences in effectiveness in social interventions. For example, meta-regression can test for differences in intervention effectiveness associated with the presence of different components. Other systematic reviews seeking to understand heterogeneity in effectiveness in complex interventions have used this method (Kaminski *et al.*, 2008; Leijten *et al.*, 2016). However, our attempts to do the same with this relatively heterogeneous set of interventions for the prevention of physical child abuse, each of which used diverse outcome measures, were frustrated by the limits of standard meta-analytic methods as few studies reported outcome measures appropriate for pooling in the same meta-analysis. Additional methods, such as mediation analyses to test causal pathways or process evaluations to describe the experience of change, require several studies for inferences to be drawn; these were not available for this body of evidence. Finally, none of these methods account for the complex nature of causation in complex interventions. For example, several components in complex interventions often combine to ‘unlock’ pathways to effectiveness. Thus, we used qualitative comparative analysis (QCA), a method that has recently been described for the synthesis of complex interventions (Thomas *et al.*, 2014), in order to understand these pathways to effectiveness in most effective versus least effective interventions.

Unlike standard meta-regression methods, QCA accounts for multiple complex *pathways to effectiveness*. By pathways to effectiveness, we mean combinations of components that, when present together, lead to an effective intervention. QCA accounts for this by focusing on the combinations of components that together form a sufficient pathway to an outcome (Rihoux and Ragin, 2009). Specifically, unlike multiple meta-regression, QCA allows for several different equally valid pathways to describe how interventions can be effective (Ragin, 2008). Also unlike standard inferential hypothesis testing-based approaches to meta-analysis, QCA is not necessarily focused on statistical significance, but rather on developing and refining theoretical understandings of the phenomena under examination. QCA is an abductive method that is iterative and oriented towards developing theoretical propositions about causal pathways to the outcome; in practical terms, QCA is theory building rather than theory testing.

To this end, we used QCA to develop an understanding of pathways to effectiveness for parenting interventions based primarily on social learning theory principles for the prevention of physical child abuse recurrence. Here, we describe social learning theory-based interventions as those that explicitly aim to teach, model and describe effective parenting, as opposed to, for example, therapies that focus primarily on psychodynamic or family systems approaches. We also focused on trials with parents who were suspected, or had substantiated reports, of child abuse. We chose this population given the importance of interrupting already challenging patterns of dysfunction. We also restricted our attention to physical child abuse as this is a prevalent form of child abuse that is distinct from, and that has distinct mechanisms from, other types of maltreatment, for example, sexual abuse (Hillis *et al.*, 2016). This form of child abuse has also been the specific focus of parenting interventions. In addition, we focused primarily on social learning theory-

‘We used qualitative comparative analysis (QCA)... to understand these pathways to effectiveness in most effective versus least effective interventions’

‘QCA is theory building rather than theory testing’

'We used standard systematic review methods to identify social learning theory-based interventions for the prevention of physical child abuse'

based interventions, or interventions characterised by teaching and developing effective parenting in order to increase positive parenting practices and avoid coercive parenting. This is because interventions falling under this broad class are more effective than interventions focusing on emotional support for parents, based on the findings of a wide-ranging review of parenting interventions for child maltreatment generally (Van Der Put *et al.*, 2018).

Methods

Study Identification

We used standard systematic review methods to identify social learning theory-based interventions for the prevention of physical child abuse, described extensively elsewhere (Vlahovicova *et al.*, 2017). A summary is included in Appendix S1 (see the online Supporting Information). In short, in the original review, we included: (a) randomised and quasi-experimental evaluations of (b) parenting interventions based *primarily* on social learning theory (although other additional non-parenting components could also be included, such as stress management strategies) for (c) parents of children aged from newborn to 18 with suspected or substantiated reports of physical child abuse. In this analysis specifically, we focus on those evaluations with treatment-as-usual or no-treatment control arms. We excluded interventions focusing solely on parental stress in order to balance the heterogeneity and homogeneity of included interventions and in the interests of coherence. Our primary outcome was the recurrence of abuse, with additional relevant outcomes (e.g. harsh parenting, risk factors for re-abuse) considered as well. We searched MEDLINE, PsycINFO, EMBASE, PubMed, Cochrane Central Register of Clinical Controlled Trials, Campbell Library, ERIC, Sociological Abstracts including Social Service Abstracts and CINAHL. All abstracts were screened and all full texts assessed by two reviewers working independently and in duplicate, with recourse to a third reviewer in cases of disagreement.

QCA methods

A summary of the steps in QCA is given in Table 1. The first step in QCA involves the creation of a data table, which captures information on: (a) whether, based on high-quality trial outcome data, interventions are considered effective as compared to controls (also known as 'calibration'); and (b) whether, based on intervention descriptions, interventions have characteristics that are believed to be relevant in understanding why interventions are (or are not) effective. Consistent with best practice in data extraction for systematic reviews, the data table was constructed by two experts working independently. These steps are conducted as follows: after identifying eligible trials, two experts examined the trial reports for evidence of intervention effectiveness and methodological rigour. In parallel, both experts classified the active interventions in the included trials as 'most effective' or 'least effective' using a predefined heuristic set of criteria, including how large the effect was, how convincing the outcome measure was (i.e. preferring official records of re-abuse over self-reported parent or child measures of re-abuse and preferring self-report measures of re-abuse over self-reported measures of risks for abuse)

Table 1. Overview of steps in qualitative comparative analysis

Step	Key questions
1. Construct a data table	Which interventions are effective and which interventions are not effective? Do interventions contain components that we think are important?
2. Construct and inspect a truth table	How many interventions 'belong' to each possible combination of components? Is there a mix of the most and least effective interventions in each combination of components? Are some components unhelpful in understanding effectiveness? Do we need to revise the included components to improve interpretability?
3. Undertake Boolean minimisation	What are the 'essential combinations' of components for the most effective or least effective interventions? Do these essential combinations encompass all the included interventions?

and finally how methodologically rigorous the estimates of intervention effectiveness presented by each trial were. We prioritised objective measures of child abuse over self-reported measures of child abuse. Whenever possible, we therefore based our decision on the effectiveness of an intervention on official records of re-abuse (i.e. reports from child protection services). Based on this outcome, we were able to determine the effectiveness of the interventions evaluated in 60 per cent of the studies (Chaffin *et al.*, 2004, 2011, 2012; Jouriles *et al.*, 2010; MacMillan *et al.*, 2005; Wolfe *et al.*, 1981). When official records or re-abuse were not available, we based our decision on the effectiveness of an intervention on observational measures of hostile and harsh parenting (Egan, 1983; Hughes and Gottlieb, 2004; Mast *et al.*, 2014), or on self-reported child abuse or the potential for child abuse (Terao, 1999). This calibration of outcome measures into meaningful distinctions is a hallmark of QCA because, unlike meta-regression which may find clinically unimportant differences statistically significant, it is more concerned with clearly distinguishing between 'successes' and 'failures'. We thus focused on the magnitude and direction of effects rather than their clinical significance.

Once the interventions had been categorised as most effective or least effective, we then labelled the interventions for the presence or absence of key intervention components that, based on prior theoretical and conceptual understandings, we expected could be of importance in understanding pathways to effectiveness. Our coding scheme was hierarchical in nature (see Table 2), and informed by prior theoretically led component schemes used in similar systematic reviews and component analyses of social learning theory-led parenting interventions (Garland *et al.*, 2008; Kaehler *et al.*, 2016; Kaminski *et al.*, 2008). Upon inspection of the resultant data table, we focused on our analysis by identifying a set of components that were theoretically salient, represented multiple aspects of social learning theory and showed enough variation in their presence versus absence across the included studies to render analysis possible.

The second step in QCA is the construction of a truth table, which is defined as a representation of the different combinations of components possible, the number of studies associated with each combination and the spread of the studies across the binary outcome (most effective or least effective). A truth table clarifies how and whether different combinations of components relate to the most effective or least effective interventions; that is, are interventions with certain combinations of components clearly most or least effective?

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'A truth table clarifies how and whether different combinations of components relate to the most effective or least effective interventions'

Table 2. Hierarchical component scheme

Psychoeducation
Explaining child developmental stages
Explaining parent–child interactions
Positive reinforcement techniques
Praise
Rewards
Disciplining techniques
Time out
Ignore
Natural/logical consequences
Proactive parenting techniques
Direct and positive commands
Rule setting
Monitoring
Attachment enhancement techniques
Parent–child play
Empathy
Skills for parents themselves
Emotion regulation skills
Problem-solving skills
Communication skills
Partner support
Motivation
Relaxation

Because QCA prioritises parsimony of explanation where possible, and because QCA is oriented towards theory building rather than theory testing, we re-examined the components that we included in our initial model for their utility in understanding differences in intervention effectiveness (Ragin, 2008; Thomas *et al.*, 2014). Thus, in keeping with the iterative nature of QCA, we inspected our truth table and made several modifications to the set of components that we included. We dropped empathy from the list of components, as it did not usefully combine with other components to yield an interpretable solution, and instead considered attachment-focused strategies more broadly. We also removed psychoeducation as it yielded contradictory combinations, sometimes associated with success and sometimes with failure; put otherwise, it did not help to discriminate clearly between the most effective and least effective interventions. We further collapsed motivational approaches and relaxation approaches into a compound condition, *parental self-management strategies*, that addressed intervention components relating to how parents account for their own behaviours, feelings and expectations.

Our final truth table included four components. First, we described *non-violent alternative punishment strategies* as learning and practising approaches to punishment that did not include violence. Second, we described *proactive parenting strategies* as techniques such as monitoring and providing clear, brief, positive commands that parents could use to prevent difficult parenting situations. These first two components are hallmarks of social learning theory-based parenting interventions (Kaehler *et al.*, 2016). Third, we described *attachment-focused strategies* as the presence of additional strategies to aid parents in developing more secure bonds with their children. Fourth, we described *parental self-management strategies* as additional components to help parents manage their own behaviours, feelings and expectations.

The final step in QCA is to use Boolean minimisation to examine the different combinations of components of the most effective and least effective interventions, and to derive a set of ‘essential’ combinations representing

‘The final step in QCA is to use Boolean minimisation... to derive a set of ‘essential’ combinations representing pathways to most effectiveness or least effectiveness’

pathways to most effectiveness or least effectiveness. Boolean minimisation is the process by which combinations for most effectiveness and least effectiveness are consolidated to identify the core underlying combinations (Rihoux and Ragin, 2009; Thomas *et al.*, 2014). It is a process of mathematical reduction, rather than a statistical procedure. As part of this process, just the components relevant to each 'essential combination' are retained in the analysis, and components whose presence or absence does not yield information about effectiveness are dropped from the essential combinations. The resultant combinations are judged for their consistency (do they include just the most effective or just the least effective interventions?) and coverage (do they include, or 'cover', all of the most effective or all of the least effective interventions?). We examined pathways to most effectiveness and least effectiveness separately.

Results

We included 14 interventions from ten evaluations in our analysis, of which we categorised nine as most effective and five as least effective (see Table 3). Two trials (Chaffin *et al.*, 2011; Egan, 1983) included arms dealing solely with parental self-management; these arms were excluded while other relevant arms from the same trial were retained. Of these included interventions that broadly follow social learning theory principles, we concluded that eight of the 14 interventions had evidence of using additional strategies derived from attachment theory to improve the parent-child relationship, six had evidence of parental self-management strategies and nine had evidence of proactive parenting strategies. The overwhelming majority – 13 of 14 interventions – also included alternative disciplining strategies; however, we included this component in the analysis as it helped to distinguish between effectiveness of different pathways.

Viewed within the overall social learning theory-based perspective, there were more nuanced differences in the specific components that were emphasised or added to fit the needs of families with a history of child abuse. For example, although the Parent-Child Interaction Therapy (PCIT) intervention is highly standardised, some interventions added components to enhance parental motivation to change (Chaffin *et al.*, 2004), or to increase parents' ability to handle feelings of stress (Chaffin *et al.*, 2011). In contrast, PCIT was delivered as originally standardised in other trial arms (Chaffin *et al.*, 2004; Terao, 1999).

Eight of the 16 possible combinations of components were present in the included interventions, as shown in our truth table (see Table 4). Each combination of components was completely consistent. What this means is that interventions with a particular combination were either consistently most effective or consistently least effective. Correspondingly, six of the combinations described pathways to most effectiveness, whereas two of the combinations described pathways to least effectiveness.

We then considered the pathways to most effectiveness and least effectiveness, derived via Boolean minimisation (see Table 5). Our pathways were able to account for all of the most effective and least effective interventions, respectively. Because the underlying combinations of components were all completely consistent (i.e. a pathway included either most

'We included 14 interventions from ten evaluations in our analysis'

Table 3. Interventions, components and evidence used to categorise effectiveness

Study reference	Intervention	Intervention description	Components					Outcomes used to categorise effectiveness	Evidence used to categorise effectiveness
			Attachment	Parental self-management	Alternative punishment	Proactive parenting			
Most effective interventions									
Chaffin et al. (2004)	Enhanced PCIT with motivation	Live coaching of parental interaction with children designed to improve parent and child interactions as well as parenting communication skills, accompanied with stress management modules delivered in group settings and informed by motivational interviewing principles; includes decisional balance exercises and commitment to change; 'enhancement' of PCIT includes individualised therapy with home visiting to support the implementation of skills in the home, as well as targeting existing mental health and substance use problems	1	1	1	1	1	Child protection services reports	Participants in this group had a 27% lower risk of recidivism as compared to those who received community treatment as usual (though a log-rank test was not significant)
Chaffin et al. (2004)	PCIT with motivation	Live coaching of parental interaction with children designed to improve parent and child interactions as well as parenting communication skills, accompanied with stress management modules delivered in group settings and informed by motivational interviewing principles; includes decisional balance exercises and commitment to change	1	1	1	1	1	Child protection services reports	Participants in this group had a 61% lower risk of recidivism as compared to those who received community treatment as usual; a log-rank test was also significant
Chaffin et al. (2011)	PCIT with stress management	Live coaching of parental interaction with children designed to improve parent and child interactions as well as parenting communication skills, accompanied with stress management modules delivered in group settings and informed by motivational interviewing principles; includes decisional balance exercises and commitment to change	1	1	1	1	1	Child protection services reports	Relative to services as usual, participants in this group had a delayed time to recidivism (HR 0.05 (95% CI 0.01, 0.31))
Chaffin et al. (2012)	SafeCare	Behavioural skills training programme to support improved parenting; uses a manualised, structured training model to teach skills and is delivered by home visitors	0	0	1	1	1	Child protection services reports	Relative to services as usual, participants in this group had a delayed time to recidivism; this was robust over multiple models
Chaffin et al. (2012)	SafeCare + coaching	Behavioural skills training programme to support improved parenting; uses a manualised, structured training model to teach skills and is delivered by home visitors; additionally, 'advisory', rather than	0	1	1	1	1	Child protection services reports	Relative to services as usual, participants in this group had a delayed time to recidivism; this was robust over multiple models

(Continues)

Table 3. (Continued)

Study reference	Intervention	Intervention description	Components				Outcomes used to categorise effectiveness	Evidence used to categorise effectiveness
			Attachment	Parental self-management	Alternative punishment	Proactive parenting		
Egan (1983)	Child and stress management	supervisory, coaching to parents in the home to support the implementation of skills for improved parenting, with visits at least monthly Child management training delivered in groups supported parents to learn observation skills for child behaviour, and then change environmental aspects and parenting behaviours to address negative child behaviours, including by time out, reinforcement and contracting with children; stress management content included cognitive behavioural techniques and cognitive restructuring, taught in group sessions, to address parental stress and emotional control	0	1	1	0	Observed hostile and harsh parenting	Observational ratings of parental behaviour with child showed improvements in a variety of domains related to communication and reinforcement of positive behaviour
Egan (1983)	Child management	Child management training delivered in groups supported parents to learn observation skills for child behaviour, and then change environmental aspects and parenting behaviours to address negative child behaviours, including by time out, reinforcement and contracting with children	0	0	1	0	Observed hostile and harsh parenting	Observational ratings of parental behaviour with child showed improvements in a variety of domains related to communication and reinforcement of positive behaviour
Jouriles <i>et al.</i> (2010)	Project Support	Teaching mothers child behaviour management skills, as well as providing instrumental and emotional support (but not teaching self-management); aims to reduce coercive disciplinary cycles and improve positive parenting	1	0	1	0	Child protection services reports	Relative to services as usual, participants in this group had less harsh parenting and observed ineffective parenting; fewer parents (78% fewer) were re-referred to child protective services but this difference was not significant
Wolfe <i>et al.</i> (1981)	Child management training	Clinic-based and home-based intervention, including group training sessions with didactic, problem-solving and modelling content, as well as self-control and self-management, alongside home visits to support the implementation of new skills	0	1	1	0	Child protection services reports	Child management skills and caseworker ratings of family treatment needs improved in the treatment group as compared to services as usual
Chaffin <i>et al.</i> (2011)	PCIT	Live coaching of parental interaction with children designed to improve parent and child interactions as well as parenting communication skills	1	0	1	1	Child protection services reports	Relative to services as usual, the PCIT arm was not different in the time to recidivism in child abuse, but suggested the possibility of harm (HR 2.04, 95% CI [0.72, 5.75])

Least effective interventions

(Continues)

Table 3. (Continued)

Study reference	Intervention	Intervention description	Components				Outcomes used to categorise effectiveness	Evidence used to categorise effectiveness
			Attachment	Parental self-management	Alternative punishment	Proactive parenting		
Hughes and Gottlieb (2004)	Incredible Years	A video-based modelling intervention, delivered in groups, for parents to learn and practise consistent, proactive parenting skills and alternative disciplinary strategies	1	0	1	1	Observed hostile and harsh parenting	Treatment gains for parenting behaviours were small and of marginal significance
MacMillan et al. (2005)	Home visiting	Home visiting by public health nurses to support mothers with an index case of child physical abuse; visits included content on strategies to improve parent-child interaction and supporting families, but specific tools were not prescribed nor manualised during individual visits	0	0	0	0	Child protection services reports	Compared to standard services, recipients in the intervention arm were not different in the recurrence of physical abuse (43% in the intervention arm vs 33% in control) or neglect (51% vs 47%), whereas hospital records showed increased recurrence of abuse in the intervention arm (24% vs 11%)
Mast et al. (2014)	I-inTERRACT	An internet-based parenting programme with live coaching, including features from PCIT and also focusing on consistent discipline methods; additional signposting to services where needed	1	0	1	1	Observed hostile and harsh parenting	Differences were based on small sample sizes and related principally to parenting behaviours
Terao (1999)	PCIT	Live coaching of parental interaction with children designed to improve parent and child interactions as well as parenting communication skills	1	0	1	1	Self-reported child abuse potential	Comparisons of 'child abuse potential' did not suggest meaningful improvement in the intervention group as compared to the control group

Note: 0 = Absent; 1 = present; HR = hazard ratio; CI = confidence interval; PCIT = Parent-Child Interaction Therapy.

Table 4. Truth table of component combinations, consistency with the most effective interventions and the least effective interventions, and the number of corresponding interventions

Combination of components	Most effective interventions: consistency	Least effective interventions: consistency	Number of interventions
attachment AND self-manage AND alternative punishment AND proactive parenting	1	0	3
attachment AND no self-manage AND alternative punishment AND no proactive parenting	1	0	1
no attachment AND no self-manage AND alternative punishment AND no proactive parenting	1	0	1
no attachment AND no self-manage AND alternative punishment AND proactive parenting	1	0	1
no attachment AND self-manage AND alternative punishment AND no proactive parenting	1	0	2
no attachment AND self-manage AND alternative punishment AND proactive parenting	1	0	1
attachment AND no self-manage AND alternative punishment AND proactive parenting	0	1	4
no attachment AND no self-manage AND no alternative punishment AND no proactive parenting	0	1	1

Table 5. Minimised pathways to the most effective interventions and least effective interventions

Pathways to ...	Minimised solution
Most effective interventions	alternative punishment AND (no self-manage AND no proactive parenting, OR self-manage AND proactive parenting) OR no attachment AND alternative punishment
Least effective interventions	no self-manage AND (no attachment AND no alternative punishment AND no proactive parenting, OR attachment AND alternative punishment AND proactive parenting)

effective or least effective trials, but not both), the minimised solutions were also completely consistent.

The possible pathways to most effectiveness reveal the importance of two components: alternative punishment strategies and parental self-management strategies. Even though alternative punishment strategies were present in 13 of 14 interventions, alternative punishment strategies *alone* formed the basis of a pathway to effectiveness. Moreover, in examining these pathways, it becomes clear that the presence of learning and practising alternative punishment strategies, in the absence of attachment-enhancing strategies and in the presence or absence of parental self-management and proactive parenting strategies, is a key way in which interventions can be effective; that is, all most effective interventions included alternative punishment. At the same time, parental self-management strategies were key to distinguishing between most effective pathways and least effective pathways. Viewed another

‘The possible pathways to most effectiveness reveal the importance of two components: alternative punishment strategies and parental self-management strategies’

‘Adding more components does not necessarily translate to greater effectiveness’

way, even if all most effective interventions did not include parental self-management, all those that did include this component were most effective.

In contrast, we identified two possible pathways to least effectiveness. The first pathway was characterised by the absence of parental self-management strategies together with the absence of the other three key parenting components. The second pathway was characterised by the presence of the other three key components but without parental self-management strategies. By combining both pathways, a common theme is observed, namely, that the absence of specific parenting components, or the presence of all of them when parental self-management strategies are left out leads to least effectiveness.

Discussion

We used QCA to understand better the combination of parenting intervention components that is most successful in reducing the recurrence of physical child abuse. Specifically, we identified combinations of components as pathways to most effectiveness and pathways to least effectiveness. Together, our findings suggest several key lessons for the implementation of social learning theory-based parenting interventions to reduce child abuse. These include: (a) adding more components does not necessarily translate to greater effectiveness; (b) teaching concrete parenting strategies is important; and (c) parental self-management strategies can be useful to help support parents alongside concrete parenting strategies. Before continuing with our interpretation and reflection, we should note that QCA models are, by nature, tentative and open to change. In the face of additional evidence, it is possible that our models could develop further and yield different findings. This is analogous to how understanding of intervention effectiveness evolves over time with additional trials and practitioner experience with interventions in the real world. However, one key upshot of our findings is that they provide an empirical basis to what physical child abuse preventionists and researchers have considered ‘best practice’, but that may not have been explicitly evidenced in intervention evaluations.

It was by no means clear that adding more components to an intervention necessarily translated to more effectiveness. In fact, learning and practising alternative punishment strategies was a key pathway to effectiveness even in the absence of other approaches. This component has been consistently predictive of effectiveness in several large-scale meta-analyses of parenting interventions (Kaminski *et al.*, 2008; Leijten *et al.*, 2018). However, combinations of interventions could also be effective. For example, teaching parental self-management strategies was a key pathway to effectiveness alongside other strategies. Previous descriptions of how empirically supported parenting interventions for child conduct disorders have been adapted for child welfare populations have emphasised the need to incorporate parental self-management alongside parenting strategies (Webster-Stratton and Reid, 2010). Given the repeated evidence that parental stress is a predictor of child maltreatment generally and physical child abuse specifically (Maguire-Jack and Font, 2017; Van Looveren *et al.*, 2017), this finding suggests an important role in supporting parents to manage their feelings, expectations and behaviours alongside developing better parenting skills.

The absence of any of the concrete strategies that we labelled was one important way in which interventions could be least effective. Though only one intervention did not include any of the components that we labelled, it was notable that this intervention generally did not describe as part of its approach any *specific* parenting strategies. It focused on supporting parenting via home visits by nurses, who had received training in social learning theory-relevant parenting strategies (MacMillan *et al.*, 2005). In contrast, effective interventions focused on teaching a set of specific parental strategies, whether parental self-management strategies, alternative non-violent punishment strategies or proactive parenting strategies. For example, interventions such as Incredible Years (Webster-Stratton, 2006) and PCIT (Eyberg and Bussing, 2010) teach parents how to play with their children as a means to improving the parent-child relationship, and how to enforce consistent limits and consequences as a means to reduce negative child behaviour. Concrete parenting strategies are a hallmark of social learning theory-led parenting interventions (Michelson *et al.*, 2013).

On the other side of the coin, interventions that tried to do too much in terms of skills for managing children by ‘stacking up’ strategies, but that did not equip parents with the tools to manage themselves may be ineffective. In parenting interventions generally, the number of components is not associated with effectiveness in child behaviour outcomes (e.g. Euser *et al.*, 2015; Kaminski *et al.*, 2008). This finding is supported by qualitative research suggesting that the process of involvement with child protective services due to, for example, suspected child physical abuse is a stressful time for which parents are not generally prepared (Smithson and Gibson, 2017). For vulnerable parents, learning and implementing a number of complex new skills without the appropriate structure for these parents to manage themselves and their own emotions can be overwhelming (Forrester *et al.*, 2016; Kemp *et al.*, 2014). This contrast is illustrated in the truth table, when considering interventions that included all three of the strategies to enhance secure attachment, proactive parenting strategies and alternative punishment strategies. Interventions with all of these components and parental self-management were uniformly most effective; similarly, interventions with all of these components but no parental self-management were uniformly least effective. Because of this, adding parental self-management strategies to parenting interventions is key to reducing the recurrence of physical child abuse.

Strengths and Limitations of this Review

As with all systematic reviews, this review has strengths and limitations. In the original systematic review (Vlahovicova *et al.*, 2017), the search was exhaustive, and included extensive grey literature searches alongside contact with authors to clarify study information and identify ongoing or missed trials. We undertook extensive efforts to find all relevant studies, though publication bias may mean that some relevant trials were not included. Similarly, outcome reporting bias may mean that some relevant outcomes were measured but not included in trials' reports. We were also unable to label the duration and intensity of described parenting strategies due to limitations in reporting.

‘Effective interventions focused on teaching a set of specific parental strategies’

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In addition, our findings relate to physical child abuse specifically, as this was the focus of the review. Our findings may not generalise to interventions for different types of abuse and maltreatment.

Specific to our analysis method, use of QCA meant that we were able to include all relevant intervention arms compared against a treatment-as-usual control. We were also able to offer empirically relevant, theoretically grounded findings on what separates effective from ineffective interventions using a method that better accounts for intervention complexity. However, as noted earlier in the Introduction, QCA is by nature an abductive method since it moves between hypothesis generation and hypothesis testing. Our findings are tentative and open to revision. In addition, while it would have been preferable for all trials to have presented a directly comparable outcome, this was not the case. While we preferred official reports of re-abuse, we also used closely related outcomes to form a picture of effectiveness. We used a heuristic method, with two graders, to determine whether interventions were most or least effective. While the use of two independent raters is a strength, it is still a limitation that not all trials presented commensurate outcomes. Moreover, a common problem in QCA is that all possible combinations of components are not represented in the included interventions. In this case, we only had evidence for eight of 16 possible combinations. It is possible that combinations we were not able to examine could form pathways to effectiveness or ineffectiveness. Because QCA focuses on practical or clinical significance, statistical significance is not generally a feature of this analytical approach. This is an epistemological difference, but it does mean that our findings should not be interpreted through a lens of ‘traditional’ statistical significance. Finally, many systematic reviews of complex interventions cannot fully account for contextual factors and other features of how the intervention was actually delivered (e.g. therapeutic alliance between social worker and family). This review was no different. More detailed information on the process of intervention delivery would have permitted an exploration of the role of these factors in shaping effectiveness.

Implications for research and practice

These present findings may be useful for intervention developers and implementers when considering new interventions in their own settings. Previous reviews and meta-analyses consistently show substantial heterogeneity in the effectiveness of parenting interventions for reducing child abuse (Barlow *et al.*, 2006; Vlahovicova *et al.*, 2017). This heterogeneity means that the extent of benefit from implementing programmes is uncertain. This heterogeneity arises, in part, because of differences in the combinations of components. Our findings can inform existing programmes in respect of components that may be worth adding, or, just as importantly, removing, in order to improve intervention outcomes. This focus on combinations may more accurately reflect the complexity of these interventions. Finally, programme providers could consider adding parental self-management components to programmes that teach parents alternative disciplining strategies.

Future research should seek to test different combinations of components to determine whether there is differential effectiveness between the pathways to most effectiveness. While some of the included trials in this review (Chaffin *et al.*, 2004, 2011, 2012) already test hypotheses about adding

‘Our findings can inform existing programmes in respect of components that may be worth adding, or, just as importantly, removing’

specific components to different interventions, a more comprehensive approach to this could inform the optimisation of interventions. A shortlist of optimal, feasible combinations could then be tested efficiently in factorial experiments (Collins *et al.*, 2007; Leijten *et al.*, 2015). In addition, process evaluation could confirm, nuance or extend the hypotheses that we have developed in this analysis about what makes interventions most or least effective for this population.

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Supporting Information

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